

APPLICATION FOR
UNITED STATES LETTERS PATENT

FOR

METHOD OF AGGREGATING AND DISTRIBUTING INFORMAL AND FORMAL
KNOWLEDGE USING SOFTWARE AGENTS

By:

MARK HALL

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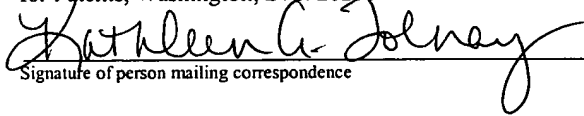
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RELATED APPLICATIONS

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3 ~~INSAI~~ 1a1 The present invention is a continuation-in-part of Provisional Serial No.
4 60/230,962 filed on September 7, 2000, which is a continuation-in-part of U.S.
5 Provisional Serial No. 60/130,843 filed on April 22, 1999 that matured into U.S. Non-
6 Provisional Serial No. 09/553,675 filed on April 21, 2000. The content of these
7 applications is incorporated herein by reference. →
8

9 Technical Field Of The Invention

10 The present invention relates to a method of knowledge management by
11 controlling the aggregation or dissemination of information from numerous disparate
12 sources including organizational databases of informal knowledge and databases of
13 formal educational content and delivering such content to an end user in real time and
14 "batch" modes of delivery. In addition to content, the method links the content to
15 required or optional products that are useful to the end user.
16

17 Background Of The Invention

18 Knowledge management incorporates two distinct areas of information: formal
19 knowledge (e.g., educational classes, courses, training, and certificate or degree
20 programs) and informal knowledge (that which is accumulated within an organization or
21 institution by its members – for instance, what is the best method sales support by an
22 organization's staff)

23 Informal, or institutional knowledge, is an increasingly important asset to a variety
24 of organizations. As employees grow older and retire, much of their experience regarding
25 the daily operations of the organization are lost forever. As new employees join the
26 organization, they must be trained and educated in these same operations. the aggregation
27 of informal knowledge into software-driven databases that may be accessible by users or
28 user groups. For example, the military might experience a loss of important repair
29 personnel during wartime. The use of informal knowledge (and formal knowledge such
30 as an online training class) could rapidly provide additional personnel to assume the

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1 military's necessary tasks. The management of such informal knowledge can
2 dramatically improve the effectiveness of organizations such as the military,
3 corporations, and other institutions.

4 Formal knowledge, on the other hand, are educational and training opportunities
5 such as classes, continuing education, training seminars, degrees and certificates as well
6 as any database that contains pedagogically structured information. Online and distance
7 learning is a increasingly important part of formal knowledge in the spectrum of
8 knowledge management. For example, online learning promises to bring high quality
9 educational services to anyone with a computer and a connection to the Internet.
10 Educational opportunities are often out of reach for many because of their circumstances.
11 For instance, a private in the military might be stationed on a base overseas. To further
12 his education, classes may be taught at his base. But, if not, he may have to postpone
13 furthering his education until his time in the military is over. A need exists for a method
14 of bringing high quality education to that soldier.

15 The military also has an interest in bringing specific content to its soldiers. For
16 example, educating an officer in tactics for a particular environment might be available
17 from different and multiple databases located at several military academies. However,
18 the officers in the field may not have time to travel to and attend seminars on these
19 tactics. Instead, a need exists for a method to provide aggregated information from
20 disparate sources regarding educational content and informal organizational knowledge,
21 serialize this content and then deliver it to the appropriate personnel.

22 While military personnel have been used in this example, any individual may
23 have the same needs. Also, many organizations face the need to have a centralized point
24 to find the educational content and the supplies (e.g., textbooks, software, online
25 libraries) that are needed to utilize or supplement that content.

SUMMARY OF THE INVENTION

The present invention relates to a method of aggregating and distributing educational content, organizational knowledge, and related supplies or services using software known as "agents" organized and orchestrated by a controlling software routine. Based on an exchange-based architecture, software agents are remotely installed on the servers of content providers. Some software agents operate autonomously but still managed by the controller software, without installation at the servers of various content providers. At the command of the controller, the agents poll and collect requested content from the content provider. Time sensitive information, for example course cost, prerequisites, instructor, and course availability, among other items, can be collected the user in real time. Data that describe institutional knowledge may also be collected in real time. After receiving the requested content from the agents, the controller distributes the collected content to a client, or group of clients. The information is sorted and selected by applying the rules and standards unique to each client end user or group of end users.

One unique aspect of this invention is to collect the information at a central point such as a single web site aggregator, for example the web site located at www.ed-x.com. This type of site will be generally referred to as the aggregator. The aggregator establishes numerous relationships with both content providers and learning resource providers. The aggregator may also have access to an organization's databases that store informal or institutional knowledge. The aggregator is accessed by the client software on the end user's computer through various wired or wireless gateways, such as the Internet or other private or public network. The controller software which is located on the aggregator site's servers instructs remote agents which are located on specific content provider's database and network servers, or such agents that may operate autonomously to poll and collect requested data which is then returned to the aggregator for further processing and then on to the end user for interaction. The controller software may furthermore instruct autonomous agents to collect data from public sources (including web pages in HTML and XML formats) according to rules and standards requested by the end user. The aggregator then distributes the requested content to the requesting clients in a specified format. In this manner, informal and formal knowledge is

1 aggregated by the aforesaid software agents, managed by controller software, and
2 returned to the user or end user group for further interaction according to rules and
3 standards.
4

BRIEF DESCRIPTION OF THE DRAWINGS

The accompanying drawings are incorporated into and form a part of the specification to provide illustrative examples of the present invention. The drawings together with their description serve to explain the principles of the invention. The drawings are only for purposes of illustrating preferred and alternate embodiments of how the invention can be made and used and are not to be construed as limiting the invention to only the illustrated and described examples.

Various advantages and features of the present invention will be apparent from a consideration of the accompanying drawings in which:

Figure 1 is a diagram of a network in which the present invention may be implemented;

Figure 2 is a chart depicting the educational exchange model disclosed herein;

Figure 3 is a diagram depicting an agent content aggregator as disclosed herein;

Figure 4 is a flowchart representing the utilization of the educational exchange model disclosed herein;

Figure 5 depicts an alternative embodiment of the invention disclosed herein;

and,

Figure 6 is a depiction of another alternative embodiment of the aggregator invention disclosed herein.

DETAILED DESCRIPTION OF THE DRAWINGS

Turning to **Figure 1**, a network diagram in which the present invention may be implemented is shown. **Figure 1** is a pictorial representation of a distributed data processing system. Distributed data processing system **100** contains a network **102**, which is the medium used to provide communications links between various devices and computers connected together within distributed data processing system **100**. Network **102** may include permanent connections, such as wire or fiber optic cables, or temporary connections made through telephone connections.

In the depicted example, a content provider **104** and learning resource provider **106** are connected to network **102**. In the preferred embodiment of the present invention, content providers **104** might be universities, colleges, foundations, private providers, corporations or an organization's institutional (or informal) knowledge database. Learning resource providers **106** may include providers that offer online libraries, textbooks, e-content, software or hardware, or financial aid or counseling. The aggregator **108** is also connected to network **102** along with storage database **110**. Clients **112** may be, for example, personal computers or network computers representing a student or corporate client networks with more than one individual client. For purposes of this application, a network computer is any computer coupled to a network, which receives a program or other application from another computer coupled to the network. Distributed data processing system **100** may also include additional servers, clients, and other devices not shown.

In the depicted example, distributed data processing system **100** is the Internet, with network **102** representing a worldwide collection of networks and gateways that use the TCP/IP suite of protocols to communicate with one another. At the heart of the Internet is a backbone of high-speed data communication lines between major nodes or host computers, consisting of thousands of commercial, government, education, and other computer systems that route data and messages. Of course, distributed data processing system **100** also may be implemented as a number of different types of networks, such as, for example, an intranet, a local area network (LAN), or a wide area network (WAN).

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Figure 1 is intended as an example and not as an architectural limitation for the present invention.

Figure 2 illustrates one embodiment of the computer architecture for the present invention. The aggregator **206** represents a link between content providers **202**, learning resource vendors **204** and clients **208**. Content providers **202** may be colleges, universities, foundations, private providers corporations, and organizations which provide downloadable content **208** for use by clients **210**. Learning resource providers **204** may be textbook companies, software or hardware providers, and financial institutions which provide financial aid for clients **210**. In the preferred embodiment, aggregator **206** is a service vendor which provides services to clients **210** seeking information and products pertaining to academic education. For example, aggregator **206** may provide clients **210** with information **208** and access to university curricula, degree plans, subjects, course schedules, textbooks, financial aid and academic or professional accreditation.

In alternative embodiments of the present invention, the aggregator **206** may take on numerous responsibilities and perform various functions. For example, if the client **210** is taking a distance learning program from a university that leads to a degree, he may want to transfer credits earned from a junior college to his present university. To accomplish this, the aggregator **206** can informally correlate the junior college courses to their equivalent courses offered by the university. It may also request the official transcript showing the junior college courses either from the client or that institution and formally request the transfer credits. This process might also be used to manage an employee's training record, an attorney's continuing legal education requirements or other similar data.

In a similar vein, the aggregator **206** can act as a credit facility. If the client **210** takes multiple distance learning courses from multiple providers, then the aggregator **206** can record those credits and provide a "transcript" for the client **210**. As the client **210** searches the multiple providers **202**, **204** for selections of either content products or services **208**, the aggregator **206** can also accumulate ratings from those clients **210** as to the quality and value of those offerings.

Another unique aspect of the present invention is the incorporation of a rewards program. The aggregator **206** can offer rewards to the client **210** for selection of

particular courses or products. For example, a client **210** may be given incentive to select a course from one content provider **202**, **204** over another in the form of tuition discounts for that or future courses. A substantially identical course might be offered by two institutions where each institution may charge \$1000 for the course. However, to persuade clients **210** to select one of the institutions, the rewards program might offer a 10% discount on a future course. The reward might also be in the form of points that are redeemable for free content **208** in the future. Alternatively, the client **210** may be offered one free course for every three paid for. The credit might also extend to the purchase of supplies. Likewise, a product vendor **204** might offer a \$100 credit with the purchase of a computer that can be used toward the cost of tuition for a course.

The rewards program might also be extended to the content and product vendors **202**, **204**. The aggregator **206** may take a fixed percentage of any amount paid for either a course or a product. If a client **210** pays \$1000 for a course, the content provider **202** may be required to pay the aggregator **206** five percent (5%) of the proceeds. In an attempt to motivate the provider **202**, **204** to list with only the one aggregator, that aggregator **206** might offer a reduction in this percentage. Alternatively, in an attempt to appeal to a special content provider, the aggregator **206** might offer to not list any directly competitive courses for a period of time. Alternatively, the aggregator **206** might offer to not list directly competitive courses for a higher fee.

Another unique aspect of this invention is its ability to aggregate formal knowledge, such as online classes, training and degree programs, with informal, or institutional knowledge. By extracting such informal knowledge from the knowledge management databases established by an organization, the remote agent can supply an end user with the organization's preferred manner of conducting its operations. These informal learning opportunities can be mixed with formal learning opportunities to provide a spectrum of knowledge acquisition from disparate data sources for the benefit of the user or user group.

With reference to **Figure 3**, the aggregator agent architecture **300** is depicted in further detail. Agent **306** is a proprietary software routine, such as the agent developed and owned by Digital E Holdings, Inc. of Austin, Texas, which is stored on the computer network composed of the databases, storage media, personal computers and servers of the

1 content provider 302 and the learning resource provider 304. Agents can be classified as
2 “remotely accessible” or “autonomous.” Remotely accessible agents are non-intrusive
3 software routines that can retrieve data from a variety of disparate databases according to
4 the instructions of a software routine known as a “controller.” Remotely accessible agents
5 are also “bilingual” in that they can instruct a database on which the agent is placed to
6 perform an instruction routine or complete some other requested task. The controller
7 software generates a set of rules and standards for the agents to gather the information in
8 a user request. Autonomous agents use the same set of rules and standards as the
9 remotely accessible agents but are not placed within a third party database. Instead they
10 retrieve data upon instruction from the controller and provide that data to the user after
11 organization of the data by the controller. Upon receipt of search instructions from the
12 aggregator 308, the agent 306 searches the network database and storage mediums of the
13 content provider 302 and/or the learning resource provider 304 for the information
14 requested by the aggregator 308. The agent search results are then transmitted to the
15 aggregator 308 for further processing, which are then transmitted to the client 310
16 requesting the information.

17 Turning now to **Figure 4**, a flowchart depicting the utilization of the present
18 invention is disclosed. Initially, the client has established an account with the aggregator
19 which includes the client’s personal and billing information (**Step 402**). Access to the
20 client’s account is controlled by a password or security protocol as is known in the art.
21 The account may also include a personal record of the client’s credits and transcripts
22 from each academic institution attended or accessed by the client. The client accesses his
23 account with the aggregator and inputs a search query pertaining to information the client
24 desires to find (**Step 404**). The aggregator transmits the search query to the remote
25 agents (**Step 406**) located on the content provider and learning resource provider
26 networks which then begin searching in real time for the requested information (**Step**
27 **408**). The agents transmit the results of the search query to the aggregator for processing
28 using rules and standards as expressed by the end user or end user group. (**Step 410**). For
29 instance, the aggregator may process the search results by analyzing and culling
30 information which is not relevant to the query posed by the client and then transmitting
31 the condensed information to the client (**Step 412**). Alternatively, the aggregator may not

1 analyze the agent search results and simply transmits the search results on to the client for
2 processing.

3 **Figure 5** is an alternative embodiment of the invention disclosed herein which
4 allows the client to retrieve customized forms of information as specifically requested by
5 the client. For example, the client may wish to view a degree plan or “course map” of the
6 various online or distance learning courses he or she will need to complete in order to
7 obtain a degree in zoology with a specialization in primates. Course content will have to
8 be obtained from several institutions to provide the degree. Initially, the client accesses
9 his or her account with the content aggregator (**Step 502**). Next, the client inputs the
10 appropriate query or commands instructing the aggregator to assemble a course map of
11 academic courses available from various academic content providers which are required
12 for a zoology degree (**Step 504**). The aggregator transmits the appropriate commands to
13 the remote agents located on various content provider databases and to autonomous
14 agents located outside of such databases to search and retrieve information on zoology
15 courses offered by each content provider (**Step 506**). After the software agents complete
16 their search and collection of information and courses related to zoology at each content
17 provider, the agents transmit the collected information to the aggregator for processing
18 (**Step 508**). The aggregator processes the information by methods known in the art for
19 categorizing and organizing electronic information according to a selected variable, such
20 as course prerequisites, course availability, course title, course location, course length,
21 course credit and course tuition cost (**Step 510**). This categorization and organizational
22 analysis enables the client to create a degree plan selected from a variety of courses
23 offered by different content providers and in effect, create a custom course map degree
24 plan based on course offerings from a single or multiple content providers. The
25 aggregator then transmits the processed information to the client which presents the
26 courses the client will need to complete to receive a specialized degree in zoology (**Step**
27 **512**).

28 **Figure 6** is another example of an alternative embodiment of the present
29 invention in which the client instructs the aggregator to locate and assemble specific
30 subject content from a variety of networked content and learning resource providers.
31 Once the client has accessed his or her account with the aggregator (**Step 602**), the client

1 enters a query instructing the aggregator to collect information on a specific topic, such
2 as roman architecture (**Step 604**). The aggregator transmits the query to the remote
3 agents located on the content provider and learning resource provider networks and
4 databases (**Step 606**). The remote agents poll and collect information on roman
5 architecture from a variety of sources, including but not limited to, architectural design
6 classes, architectural product suppliers, architectural historical associations, and other
7 architectural databases and then transmit the collected content to the aggregator for
8 processing (**Step 608**). The aggregator categorizes the content in the format specified by
9 the client where, in this example, the client is provided with a list of various sources with
10 content directed towards roman architecture which may include the blueprints of the
11 coliseum from an archive, an online course on the impact of roman architecture in the
12 development of civilization, and plastic model reproductions of roman columns or,
13 perhaps, what a colleague within the user's organization may have recorded regarding
14 roman architecture upon the organization's database. The aggregator can also sort
15 through online educational content that can be accessed at a submodular level (for
16 example, a chapter of a textbook in electronic format) to create content that, when added
17 together, comprise a customized online course in roman architecture from various content
18 providers for that particular user or user group. Textbooks, course content, graphical
19 images, and other accessible data can be pulled from to create customized content. (**Step**
20 **610**). The aggregator then transmits the processed content to the client (**Step 612**).

21 The matters set forth in the foregoing description and accompanying drawings are
22 offered by way of illustration only and not as limitations. Other applications and
23 variations of the invention disclosed herein will become evident to those skilled in the art.
24 The actual scope of the invention is intended to be defined in the following claims when
25 viewed in the proper perspective based on the relevant prior art.